REMARKS

Applicants request entry of this Amendment, reconsideration and allowance.

Applicants confirm their prior provisional election of claim 1-4. Applicants traverse the restriction requirement. Applicants argue that the process as carried out will of necessity result in the product with all the limitation of claims 1-4. Likewise, there is no evidence of record that the product of claim 1-4 can be made by processes other those of claims 5- 9.

Applicants confirm that Figures 1-6 are prior art. An amendment to the drawings adding the legend "PRIOR ART" to Figures 1-6 is submitted with this Amendment.

The invention is patentable over the art of record because the art fails to show or suggest electric motors with resin bodies that hold embedded conductors and have axial slots for holding cooling bodies.

The squirrel cage rotor of claim 1 is manufactured with a composite material such as a polymer resin body 132. It contains powder of high magnetic permeability that reduces its weight. The polymer resin body 132 has conductor bars positioned around and embedded in the resin body. The resin body also has heat pipes 135 that dissipate heat generated by induction between the stator and the rotor of the motor.

The office action admits that Kliman et al. (US Pat. No. 5,990,588) fails to show or suggest:

(1) axial slots,

(2) powder with high magnetic permeability uniformly distributed in a polymer resin, and

(3) conductive bodies or heat pipes.

The action identifies 116 of Kilman as a conductor for the motor. That is clearly erroneous and is not supported by the reference. In contrast, 116 is an aluminum tube used to fabricate the core. Once the core is fabricated, the tube 116 is removed. See col. 7, lines 9-20. As such, there are no conductor bars and no end rings as called for in the claims.

The office action indicates that Garvey et al. (3,246,188) has heat pipes. That is clearly erroneous and is not supported by the Garvey et al. patent. The items 16 in Garvey are air ducts, not heat pipes. See column 3, line 28. The air ducts are openings between adjacent laminations 14. They are not cooling bodies (calim1) , because they are an absence of structure and have no body at all. Nor are they heat pipes that carry isothermal cycling

materials such as ammonia, methanol or Freon. See claims 2, 7, and 8. Since the space 14 are open, they do not show sealed heat pipes as called for in claim 9.

Both Kilman and Garvey fail to show or suggest a molded core of polymer resin body containing powder of high magnetic permeability. Ward et al. Patent (US Pat. No. 5,211,896) relates to coating a polymer on ferromagnetic particles. Those particles may be formed into magnetic cores. See Ward at col.7, lines 43. However Ward is silent about electric motors and fails to show or suggest using his particles in motors with resin bodies having conductors molded into the body and axial slots that hold cooling bodies.

Claim 3 is patentable over the art of record. It was rejected based upon the three references discussed above in combination with the Boyarkin reference. Kilman, Garvey and Ward fail to show the basic elements of claim 3 and Boyarkin does not show the elements missing from the other references. Boyarkin teaches away from the invention. Boyarkin relies upon a two-piece rotor with an inner core that is free to rotate. It fails to show or suggest increasing the permeability of a resin body rotor made in accordance with claims 1 and 2.

Claim 4 is likewise patentable over the art of record. The rejection fails to identify any reference that shows chopped fibers for increasing the thermal and mechanical properties of the resin rotors.

In summary, the objections to the application and the rejection have been overcome by this Amendment and the amendment to the drawings. Applicants request a notice of allowance.

Respectfully submitted,

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ADDENDUM

MARKED-UP COPY SHOWING AMENDMENTS MADE TO THE SPECIFICATION

Page 1, line 23:

[DESRIPTION] DESCRIPTION OF THE PRIOR ART

Page 1, line 27- p. 2, line 3:

The quality of machined products mainly depend on the precision of machine tool which is equipped with built-in type spindle system that is composed of the rotor of motor and the spindle shaft, but the heavy mass of rotor can deteriorate_dynamic stability of the built-in type spindle system because the heavy mass of rotor may cause excessive stress and deformation. Therefore, it is important to reduce the inertial force of the rotor by reducing mass of rotor.

Page 3, line 20 - page 4, line1:

However, this squirrel cage conductor 23 has a problem of high machining cost. [zn] In order to solve this problem, another composite squirrel cage rotor 30 is proposed as shown in Figs. 5 and 6. This composite squirrel cage rotor 30 includes, two end rings 37. A [Plurality] plurality of holes are formed in each of the end rings 37 and the both ends of the same number of conductor bars 38 are inserted into [hoes] holes of two end rings 37 by interference fit, with appropriate axial load.

Page 6, lines 12, 13:

Fig. 3a is a perspective view of another [converitiohal] conventional composite squirrel cage type rotor;

Page 8, lines 2-4:

Powder of high magnetic permeability is employed to enhance magnetic property of polymer resin part. This powder [to] should be uniformly distributed in the polymer resin part.

Chopped fibers with the length of 0.5 to 50 mm may be added to the polymer resin part so as to improve mechanical properties such as thermal stability and stiffness of the rotor structure.

Page 8, line15 - page 9, line 5:

As mentioned above, the heat pipes 135 are inserted into the slots 134 of the squirrel cage conductor 133 so as to dissipate heat generated during the induction operation. In this case, the heat pipes 135 are fixed in the slots 134 [try] by polymer resin during the curing of the polymer resin part 132. The heat pipe is a sort of cooling device in which heat is transmitted from a heat source to a heat sink while circulating functional fluid, such as ammonia, methanol, Freon or the like, repeats an isothermal cycling process in vacuum sealed pipes. Heat is absorbed in the process of the phase change of the functional fluid from a liquid phase to a gaseous phase when the heat is applied to the heat pipe, gaseous functional fluid moves from a heat source side of the heat pipe to the opposite side, and heat is dissipated in the process of the phase change of the operating fluid from a gaseous phase to a liquid phase, thereby removing heat.

In order to increase magnetic flux density of the composite squirrel cage rotor, an inner core 136 made of material having high magnetic permeability, such as steel, may be inserted between the rotating shaft 131 and the polymer resin part 132. In this case, the inner core 136 has a. role of guiding magnetic flux from the stator to the [mrtor] motor effectively.

Page 10, lines 6-16:

In the method for fabricating the composite squirrel cage rotor, the rotating shaft 131 and the inner core 136, need not to be assembled together with the squirrel cage conductor 133. After disposition of the heat pipes 135 into the slots 134 and inserting the squirrel cage conductor 133 into the mold cavity 142, polymer resin containing powder of high magnetic permeability is injected into the_mold cavity 142 and is cured in an autoclave under predetermined curing conditions. Accordingly, the polymer resin is cured at the cavity of the squirrel cage conductor 133 and the gaps between the slots 134 and the heat pipes 135.

When the polymer resin part is cured, the center portion of the filled squirrel cage conductor 133 is bored [fbr] for assembly of inner core 136 using a drill. The inner core 136 -

is inserted into the bored center portion in the center of the composite squirrel cage rotor. The rotating shaft, 131 is inserted into the inner core 136. Through these processes, the composite squirrel cage rotor having a polymer resin part containing powder of high magnetic permeability is completed.

Page 12, lines4-6:

Additionally, the present invention provides a composite squirrel cage rotor in which powder of high magnetic permeability is uniformly distributed in the [polymet] polymer resin part, so that magnetic property is enhanced, thereby improving the performance of the motor.

MARKED-UP COPY SHOWING AMENDMENTS MADE TO THE CLAIMS

Please amend the claims as follows:

1.(Amended) A composite squirrel cage rotor, comprising:

a rotating shaft;

a polymer resin body [part] containing powder of high magnetic permeability, wherein said powder is uniformly distributed in the polymer resin body; [and]

a plurality of squirrel cage conductor bars positioned around and embedded in the outer part of the polymer resin body and [part,] formed of material having high electric conductivity; [and provided with a plurality of axial slots;

wherein said powder of high magnetic permeability is uniformly distributed in the polymer resin part.]

a plurality of axial slots, wherein said axial slots are formed between said cage squirrel conductor bars; and

cooling bodies inserted into the axial slots for dissipating heat generated in the composite squirrel cage rotor.

2.(Amended) The rotor according to claim 1, wherein said cooling bodies are [said slots of the squirrel cage conductor are provided with a plurality, of] heat pipes[, respectively].

3. (Amended) The rotor according to claim 1, further comprising an inner core of high magnetic permeability so as to increase [improve the performance of the motor by increasing] the magnetic flux density of the rotor.

4.(Amended) The rotor according to any of claim 1 to 3, wherein chopped fibers are added to said polymer resin body [part] in order to enhance the mechanical properties such as thermal stability and stiffness of the rotor structures.

5. (Amended) A method for fabricating a squirrel cage rotor, said, rotor [having] with a rotating shaft, a plurality of conductor bars, two end rings and a polymer resin part, comprising the steps of:

surrounding each of the conductor bars by a pair of [jig] jigs; inserting the [bod] ends of the conductor bars into the holes of end rings;

removing the jigs from each conductor bar;

curing a polymer resin part [contailcling] containing powder of high magnetic permeability while filling the cavity between the squirrel cage conductor and the mold cavity composed of two blocks; and

grinding the outer surface of composite squirrel cage rotor combined with squirrel cage conductor and the polymer resin part.

7. (New) The rotator according to claim 1, wherein said cooling bodies including isothermal cycling material therein.

8. (New) The rotor according to claim 7, wherein said isothermal cycling materials are an ammonia, methanol and Freon.

9. (New) The rotor according to claim 2, wherein said heat pipes are sealed pipes.